

Documentation of changes to AP-42 Fifth Edition

This is a documentation of the changes which were made to Sections of the Fifth Edition of AP-42, *Compilation of Air Pollutant Emission Factors* in the annual Supplements.

Section 1.1 (Bituminous and Subbituminous Coal Combustion)

Table 1.1-1, page 1.1-3, and Table 1.1-2, page 1.1-6

Issue: SCC for fluidized bed combustor, circulating bed was inaccurate.

Action Taken: SCC was changed from 1-01-002-17, 1-02-002-17, and 1-03-002-17, to 1-01-002-18, 1-02-002-18, and 1-03-002-18.

Issue: Several footnotes required clarification to explain the notation of some emission factors in the tables. Some readers were finding an emission factor designated by "38S" confusing.

Action Taken: Clarifications were added to the table footnotes that indicated "if fuel is 1.2% sulfur, then S equals 1.2." Similar clarification was added to the footnote for CO₂.

Table 1.1-3, page 1.1-10

Issue: For the bubbling bed combustor, the PM-10 emission factor was higher than the filterable PM emission factor.

Action Taken: For fluidized bed combustors (bubbling bed and circulating bed), the factors are replaced with footnote "m." The revised footnote "m" directs the user to the emission factor for "spreader stoker with multiple cyclones and no flyash reinjection." The similarity of emissions is supported on page 4-12 of the April 1993 Emission Factor Documentation.

Table 1.1-3, page 1.1-9 and Table 1.1-4, page 1.1-12

Issue: SCC for fluidize bed combustor, circulating bed, was inaccurate.

Action Taken: SCC was changed from 1-01-002-17, 1-02-002-17 and 1-03-002-17, to 1-01-002-18, 1-02-002-18, and 1-03-002-18.

Table 1.1-4, page 1.1-12

Issue: Filterable was misspelled in the table header.

Action Taken: The misspelling was corrected.

Table 1.1-5, page 1.1-15 and Table 1.1-6, page 1.1-16

Issue: Several footnotes required clarification to explain the notation of some emission factors in the tables. Some readers find an emission factor designated by "1.6A" confusing.

Action Taken: Clarifications were added to the table footnotes that indicate "if coal ash weight is 8.2%, then A equals 8.2."

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Table 1.1-8, page 1.1-18

Issue: In each column of the April 1993 version of this table, emission factors appear to have been misplaced from those in the September 1988 version. Most emission factors appear in the wrong column. For example, most of the September 1988 emission factors in the column for multiple cyclone with flyash reinjection appear in the uncontrolled column in the April 1993 version, and the September 1988 uncontrolled emission factors do not appear in the April 1993 version.

Action Taken: All cumulative particle size emission factors for spreader stokers are corrected. In revising Table 1.1-8, a new uncontrolled cumulative emission factor for each particle size was calculated by multiplying the appropriate cumulative mass percent by the total filterable PM value, instead of using the September 1988 factors. The calculation is consistent with the methodology described on page 4-25 of the April 1993 Emission Factor Documentation.

Table 1.1-11, page 1.1-21

Issue: SCC for fluidized bed combustor, circulating bed was inaccurate.

Action Taken: SCC was changed from 1-01-002-17, 1-02-002-17, and 1-03-002-17 to 1-01-002-18, 1-02-002-18, and 1-03-002-18.

Issue: No data was found on emission factors for fluidized bed combustor, bubbling bed. According to the footnote, the emission factor for fluidized bed combustors, circulating bed should be used. The emission factor for bubbling bed was not the same as for fluidized bed.

Action Taken: The emission factor for bubbling bed was changed from 5.9 lb/ton to 5.5 lb/ton.

Table 1.1-12, page 1.1-22

Issue: SCC for fluidized bed combustor, circulating bed was inaccurate.

Action Taken: SCC was changed from 1-01-002-17, 1-02-002-17, and 1-03-002-17 to 1-01-002-18, 1-02-002-18, and 1-03-002-18.

Section 1.2 (Antracite Coal Combustion)

Table 1.2-2, page 1.2-4 and Table 1.2-4, page 1.2-5

Issue: No SCC was provided for residential space heaters.

Action Taken: SCC A2104001000 was provided.

Section 1.3 (Fuel Oil Combustion)

Table 1.3-1, page 1.3-2 and Table 1.3-2, page 1.3-4

Issue: Emission factors for filterable PM were represented in the table by footnotes. In the footnote, a short formula was provided to determine the emission factor.

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Action Taken: In order to make the emission factors more concise, the formulas presented in the footnotes for filterable PM were moved into the table.

Issue: Several footnotes required clarification to explain the notation of some emission factors in the tables. Some readers were finding an emission factor designated 0.24S confusing.

Action Taken: Clarifications were added to the table footnotes that indicated "if fuel is 1.2% sulfur, then S equals 1.2." A similar clarification was made to the CO and NO_x footnotes.

Issue: No SCC was provided for residential furnaces.

Action Taken: SCC A2104004/A2104011 was provided for residential furnaces.

Table 1.3-4, page 1.3-8

Issue: The proper number of decimal places was not included in the emission factors for industrial boilers firing No. 6 and No. 5 oil.

Action Taken: The emission factors were changed from "1" to "1.00."

Table 1.3-5, page 1.3-9, Table 1.3-6, page 1.3-10, and Table 1.3-8, page 1.3-12

Issue: Several footnotes required clarification to explain the notation of some emission factors in the tables. Some readers were finding an emission factor designated by "38S" confusing.

Action Taken: Clarifications were added to the footnotes to indicate that "if fuel is 1.2% sulfur, then S equals 1.2."

Table 1.3-9, page 1.3-16

Issue: The English units were in lb/10¹² Btu.

Action Taken: The English units and corresponding emission factors were changed to lb/10³ gal.

Table 1.3-10, page 1.3-17

Issue: Due to typographical error, Table 1.3-10 in Section 1.3 was mistakenly entitled Table 1.1-10.

Action Taken: The table heading is changed from 1.1-10 to 1.3-10.

===== Section 1.4 (Natural Gas Combustion)

Table 1.4-2, page 1.4-4

Issue: The CO emission factor for commercial boilers (0.3 - <10 MMBtu/hr) with low NO_x burners was 27 lb/10⁶ ft³ and was based on four data points from a paper titled "A Low NO_x Burner for Gas-Fired Firetube Boilers." It appears that the four data points had been correctly converted from ppm @ 0% O₂ to lb/10⁶ ft³ but incorrectly averaged in the April 1993 Emission Factor Documentation.

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Action Taken: The CO emission factor is changed from 27 to 15 lb/10⁶ ft³ after reaveraging the data.

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Section 1.6 (Wood Waste Combustion In Boilers)

Table 1.6-1, page 1.6-4

Issue: Significant figures for some PM and PM-10 emission factors in Table 1.6-1 did not match significant figures for particle size distribution factors in tables 1.6-8 and 1.6-9.

Action Taken: Significant figures were added to some PM and PM-10 emission factors.

Table 1.6-2, page 1.6-6

Issue: The footnotes for NO_x and CO were confusing.

Action Taken: The footnotes were clarified by deleting the sentence that read "Higher values in the range (parentheses) should be used..."

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Section 1.7 (Lignite Combustion)

Table 1.7-1, page 1.7-3 and Table 1.7-2, page 1.7-4

Issue: Footnote "f" applies to the whole SO_x column of the table and not just one number in the table.

Action Taken: The footnote "f" was moved into the header of the SO_x column.

Issue: The firing configuration "other stoker" needed clarification.

Action Taken: Other stoker was clarified as a traveling grate (overfeed) stoker.

Issue: One footnote required clarification to explain the notation of some emission factors in the tables. Some readers were finding an emission factor designated by "38S" confusing.

Action Taken: Clarifications were added to the table footnotes that indicated "if fuel is 1.2% sulfur, then S equals 1.2."

Table 1.7-3, page 1.7-5 and Table 1.7-5, page 1.7-7

Issue: Some footnotes required clarification to explain the notation of some emission factors in the tables. Some readers were finding an emission factor designated by "2.2A" confusing.

Action Taken: Clarifications were added to the footnotes that indicated "if lignite is 5% ash, then A equals 5."

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Section 1.11 (Waste Oil Combustion)

Table 1.11-3, page 1.11-5

Issue: The TOC factor for small boilers and space heaters (vaporizing and atomizing burners) was 1.0 lb/1000 gal (0.1 kg/m³) in 1988 but was changed to 0.1 lb/1000 gal in 1995.

However, the April 1993 Emission Factor Documentation does not indicate that TOC

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emission factors were updated. The TOC value is 1.0 lb/1000 gal in FIRE. It appears that the metric value from 1988 (0.1 kg/m³) was mistakenly transposed to the English column (as 0.1 lb/1000 gal) when the table was revised in 1995.

Action Taken: The TOC emission factor in the table is changed back from 0.1 to 1.0 lb/1000 gal.

Section 3.1 (Stationary Gas Turbines For Electricity Generation)

Table 3.1-2, page 3.1-4

Action Taken: A sentence was added to footnote "a": (Condensables are also PM-10 and all PM from oil- and gas-fired turbines are less than 1 micrometer in size and therefore considered PM-10.)

Table 3.1-2, page 3.1-4

Action Taken: A sentence was added to footnote "e": (When sulfur content is not available, 0.6 lb/10⁶ ft³ (0.0006 lb/MMBtu) can be used; however, equation is more accurate.)

Table 3.1-4, page 3.1-6

Issue: The wrong units were presented for SCR (with water injection).

Action Taken: The units were changed from ng/J to lb/MMBtu.

Section 3.2 (Heavy-duty Natural Gas-fired Pipeline Compressor Engines)

Table 3.2-2, page 3.2-4

Issue: The incorrect SCC was presented for 4-cycle lean burn and 4-cycle rich burn engines.

Action Taken: The SCC for 4-cycle lean burn was changed from 2-01-002-53 to 2-02-002-54. The SCC for 4-cycle rich burn was changed from 2-02-002-54 to 2-02-02-002-53.

Table 3.2-5, page 3.2-7

Issue: No SCC was provided for 4-cycle rich burn engines.

Action Taken: SCC 2-02-002-53 was provided.

Issue: A "less than" symbol (<) was missing from several emission factors in the table.

Action Taken: The "less than" symbol (<) was added to the table.

Section 3.4 (Large Stationary Diesel And All Stationary Dual-fuel Engines)

Table 3.4-2, page 3.4-4

Issue: In footnote "d", a natural gas heating value of 20,300 Btu/lb was incorrectly listed.

Action Taken: The correct heating value of 1050 Btu/scf was inserted.

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Section 5.3 (Natural Gas Processing)

Page 5.3-1 Paragraph two

Action Taken: Updated reference for "Protocol For Equipment Leak Emission Estimates" from 1993 EPA document to EPA-453/R-95-017, November 1995. Updated the name of the Gas Research Institutes software model to GRI-GLYCalc.

Page 5.3-4 footnote e

Action Taken: Updated reference for "Protocol For Equipment Leak Emission Estimates" from 1993 EPA document to EPA-453/R-95-017, November 1995.

Table 5.3-2 pages 5.3-5 & 5.3-6

Action Taken: Corrected the State abbreviation for Arkansas from AZ to AR

Section 7.1 (Organic Liquid Storage Tanks)

Action Taken: Section was completely revised to reflect updated emission estimates.

Section 9.5.2 (Meat Smokehouses)

Action Taken: New Section

Section 9.5.3 (Meat Rendering Plants)

Action Taken: New Section

Section 9.8.1 (Canned Fruits And Vegetables)

Action Taken: New Section

Section 9.8.2 (Dehydrated Fruits And Vegetables)

Action Taken: New Section

Section 9.8.3 (Pickles, Sauces And Salad Dressings)

Action Taken: New Section

Section 9.9.2 (Cereal Breakfast Food)

Action Taken: New Section

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Section 9.9.5 (Pasta Manufacturing)

Action Taken: New Section

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Section 9.11.1 (Vegetable Oil Processing)

Action Taken: New Section

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Section 9.12.2 (Wines And Brandy)

Action Taken: New Section

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Section 9.13.2 (Coffee Roasting)

Action Taken: New Section

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Section 10.7 (Charcoal)

Action Taken: New Section

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Section 11.10 (Coal Cleaning)

Action Taken: Section was completely revised to reflect updated emission estimates.

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Section 11.14 (Frit Manufacturing)

Action Taken: Section was completely revised to reflect updated emission estimates.

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Section 11.19.1 (Sand And Gravel Processing)

Action Taken: Section was completely revised to reflect updated emission estimates.

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Section 11.22 (Diatomite Processing)

Action Taken: New Section.

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Section 11.28 (Vermiculite Processing)

Action Taken: New Section.

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Section 13.2.1 (Paved Roads)

Action Taken: Editorial Changes were made to add definition and units of Vehicle weight (affects only paper and FAX versions). An explanatory paragraph was added to the top of Page 13.2.1-3 to clarify the application of the equation to average traffic and not to individual vehicles or classes of vehicles.

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Section 13.2.2 (Unpaved Roads)

Action Taken: An explanatory paragraph was added below the discussion of the particle size multiplier on Page 13.2.2-3 to clarify the application of the equation to average traffic and not to individual vehicles or classes of vehicles.

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Appendix B.2 (General Particle Size Distributions)

Action Taken: The page numbers on Page B.2-3 for B.2.1 and B.2.2 were revised to reflect the actual page (B.2-5) where the Paragraph begins.